CHAPTER 3 – INSPECTIONS

3.3 DRINKING WATER INSPECTIONS

3.3.1 Statutory Authority and References

Statutory Authority
Inspections are conducted at Public Water Systems (PWS) to determine whether the facilities are meeting their environmental obligation and to assist them in achieving compliance.

Statutory authority to conduct inspections is granted by Missouri Safe Drinking Water Statute 640.100.4 and 640.120.5 RSM0.

> The department of natural resources shall establish and maintain an inventory of public water supplies and conduct sanitary surveys of public water systems. Such record shall be available for public inspection during regular business hours.
>
> Duly authorized representatives of the Department of Natural Resources, with prior notice, may enter at reasonable times upon any private or public property to inspect and investigate conditions relating to the construction, maintenance, and operation of a public water supply, and take samples for analysis. If the director or his representative has probable cause to believe that a public water supply system is located on any premises, he shall be granted entry for the purpose of inspection and sample collection. Should entry be denied, a suitably restricted search warrant, upon a showing of probable cause in writing and upon oath, shall be issued by any judge or associate circuit judge having jurisdiction to any representative of the department to enable him to make such inspections.

Regulatory authority to conduct inspections is granted by Missouri Safe Drinking Water Regulation 10 CSR 60-4.010(7)(D).

> The department, at its discretion, may conduct routine inspections of any public water system or make other necessary inspections to determine compliance with these rules. If, after investigation, the department finds that any public water system is incompetently supervised, improperly operated, inadequate, of defective design or if the water fails to meet standards established in 10 CSR 60, the water supplier must implement changes that may be required by the department.

References
Missouri Safe Drinking Water Law, Sections 640.100 through 640.140, Revised Statutes of Missouri (RSMo).

Missouri Safe Drinking Water Regulations, 10 CSR 60-1.010 through 10 CSR 60-16.030.

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Missouri Department of Natural Resources Public Drinking Water Branch, *"Standards for Non-community Public Water Supplies, 1982".*

* January 1988, Missouri Department of Natural Resources Public Drinking Water Branch, *"Design Guide for Community Public Water Supplies"*.

* February 1965 Missouri Department of Natural Resources Division of Environmental Quality, *"A Guide for the Design and Construction of Ground Water Supplies, Storage, and Distribution Facilities"*.

* May 1963, Missouri Department of Natural Resources Division of Environmental Quality, *"A Guide for the Design of Treated Water Supplies, Storage, and Distribution Facilities"*.

January 1992, Missouri Department of Natural Resources Public Drinking Water Branch, *"Guidance Manual for Surface Water System Treatment Requirements"*.

January 1997, Missouri Department of Natural Resources Public Drinking Water Program, *"Inspection and Enforcement (I&E) Manual".*

April 26, 2002, *"SDWIS/State User's Guide for Release 8.0"*.

* - Facility components should be evaluated based on the requirements of the Design Guide in effect at the time of construction of the component. Because this type of time consuming evaluation can be burdensome, it is typical for facilities to be evaluated based on the most recent Design Guide. Should issues arise, the inspector can at that time provide additional research into the construction date of the item(s) in question. Alternately, inspectors may choose to evaluate facility components based on the approved plans and specifications for the facility.

3.3.2 Well Site Surveys

Purpose
The purpose of the site survey is to assist the municipality, water district, or owner in locating a site for a new well that minimizes the potential for contamination of the source water.

Forms
- Report of Field Survey

Equipment
In addition to the equipment listed in Section 3.1.7 in the General Inspection Procedures chapter, the following equipment should be used for site surveys of public water system wells.
- Global Positioning System (GPS) unit

Procedure
The site survey process is generally started by receipt of the estimated well casing depth letter from the Water Resources Center or a call from the owner or their engineer requesting a casing depth. Regional office engineering staff will make an on-site survey of each location for a proposed public water supply well. The site survey should be conducted as soon as possible. Contact with the owner or the engineer should be made to determine the

location on the site where the well is being proposed. Generally, it will be the highest elevation at the site.

The Design Guide for Community Water Systems section 3.2.3.2.a. discusses well isolation standards. Figure 2 – New Well Isolation Radii below indicates the minimum distance proposed wells must be located from potential sources of contamination. It is also important to keep in mind the requirements of 10 CSR 60-3.010, 3.020, and 3.030. It may be necessary to advise a potential water system concerning the Continuing Operating Authority regulation and the need for a waiver from a higher continuing operating authority, if applicable.

Source of Possible Contamination	Minimum Isolation Radius
Wastewater treatment plants, wastewater lagoons, chemical storage, landfills, petroleum storage tanks, or wastewater and solid waste disposal fields	300 feet
Manure storage area, unplugged abandoned well, graves, subsurface disposal field, sewage pumping stations, building or yard used for livestock or poultry, privy, cesspool, or other contaminants that may drain into the soil	100 feet
Sanitary sewer lines, existing wells, pits, sumps or holes, septic tanks, lakes or streams	50 feet
The right-of-way of federal, state, or county road	10 feet

The *"Standards for Non-Community Public Water Supplies (1982)"* section 3.3.3.a. discusses well isolation standards. The table below indicates the minimum distance proposed wells must be located from potential sources of contamination.

Source of Possible Contamination	Minimum Isolation Radius
Sanitary sewer lines	50 feet
Sewage treatment plants, septic tanks, disposal fields	300 feet
Chemical storage, buried fuel tanks	300 feet
Lakes or streams	50 feet

When travelling towards the site it is recommended that observations be made of sources of contamination or existing wells within a one-mile radius. While on site, locate the site of the well and document by using a Global Positioning System (GPS) unit or on a topographical map. Then locate any potential sources of contamination or existing wells that may be near or within the isolation radii noted above. If GPS equipment is not used, physical on-site measurements should be taken to note the distances between the proposed well and potential source of contamination. If operating wells are located in close proximity to each other, the effects of drawdown should be discussed in the report. Contact with the Water Resources Center may be needed for assistance on this issue.

Generally, restaurants and convenience stores are facilities located on pieces of property that have enough room for the building and parking and little else. At convenience stores observe carefully the petroleum storage

tank locations and evidence of current or past leakage. If these situations arise, contact the Water Resources Center and the Public Drinking Water Branch Permitting Section to determine what requirements will be needed to ensure protection of the well.

Reporting
All owner information and observations should be documented on the Report of Field Survey form. A written report/letter should be provided to the municipality, water district, or owner indicating any problems observed during the site survey. Maps prepared from the GPS data using Geographical Information System software if available are very helpful in presenting the findings of the site survey, and may be included. A reminder that engineering and a construction permit are needed prior to construction should be included. All new community and non-transient non-community public drinking water facilities are required to have a construction permit prior to construction of the facilities. Transient non-community systems may be required to have a Construction Permit per 10 CSR 60-3.010(2)(B)2.A. The report/letter should indicate whether a construction permit is needed.

Send copies of the completed form and report/letter to the Public Drinking Water Branch and the Water Resources Center, and file a copy in the appropriate system file. If requested, provide a copy to the well driller or engineer.

3.3.3 Well Grouting Surveys

Purpose
The purpose of the well grouting survey is to observe the grouting and to collect information on the construction of the well that is necessary to evaluate the well as a public water supply source.

Forms
- Survey of Pressure Grout Sealing of Well Casing
- Point Locational Data Collection Sheet

Equipment
In addition to the equipment listed in Section 3.1.7 in the General Inspection Procedures chapter, the following equipment should be used for well grouting surveys of public water system wells.
- Global Positioning System (GPS) unit

Procedure
The well grouting survey process is started by notification from a well driller. Well drillers are encouraged to notify the department at least 48 hours in advance of a well grouting to schedule a well grouting survey for hours during the normal work day. Regional office engineering staff should conduct well grouting surveys on each new public water supply well. A Survey of Pressure Grout Sealing of Well Casing form must be completed for each new public water supply well. If regional office engineering staff is not available to conduct the survey, the project engineer must submit a completed form for projects requiring construction approval, and the well driller must submit a completed form for projects not requiring construction approval.

The Design Guide for Community Water Systems (August 2003) section 3.2.5.11 discusses grouting requirements and approved grouting methods for community water systems. The *"Standards for Non-Community Public Water Supplies (1982)"* section 3.5.7 discusses the grouting requirements for non-community water systems.

All new community and non-transient, non-community public drinking water facilities are required to have a construction permit prior to construction of the well. Transient non-community systems may be required to have a construction permit per 10 CSR 60-3.010(2)(B)2.A. Conduct database and file searches prior to conducting the survey to insure proper construction authorization has been obtained before construction has begun. Prior to the inspection, obtain the engineering project file for the approved project and review the approval report, plans and specifications to become familiar with the project.

Locate the site of the well and document by Global Positioning System (GPS) unit or on a topographical map. Prior to the start of grouting, ask the driller what has been done to determine that the well casing is plumb and centered in the hole. (For example, has the casing been turned in the drill hole?) The size and thickness of the casing should be checked prior to grouting. Ask for the cement to water ratio of the neat cement. Scan the drill site and find a safe location to observe the grouting without being in the way of the workers or equipment.

Reporting
Most of the information required on the Survey of Pressure Grout Sealing of Well Casing form can be obtained from the well driller or project engineer prior to the well grouting. The remainder of the information should be completed soon after the well grouting. Other information that pertains to the construction of the well should be obtained and noted in the narrative section of the form.

Send copies of the completed form to the Public Drinking Water Branch and the Water Resources Center, and file the original in the appropriate system file. If requested, provide a copy to the well driller, engineer or owner. GPS readings must be recorded on the Point Locational Data Collection Sheet with a copy sent to the Public Drinking Water Branch and the original placed in the system file.

3.3.4 Construction Inspections

Purpose
The purpose of the construction inspection is to determine the progress of the project, to identify any significant construction problems and to see if the work is being done in accordance with the approved plans and specifications.

Forms
- Report of Construction Inspection
- Record of Construction Inspection

Equipment
The equipment is listed in Section 3.1.7 in the General Inspection Procedures chapter.

Procedure
Regional office engineering staff should conduct construction inspections when requested by the system, a project engineer, department management or at random. When traveling to an area to conduct other types of inspections, it is beneficial to locate construction projects in that area to observe if time allows.

Regional office engineering staff will conduct a pre-construction conference and quarterly inspections of Drinking Water State Revolving Fund (DWSRF) construction projects. The DWSRF coordinator will provide the inspection list.

Community and non-transient non-community water systems are required by 10 CSR 60-3.010 to obtain written authorization from the department prior to construction, alteration or extension of these systems. Transient non-community systems may be required to obtain approval to construct, at the discretion of the department. Community systems constructing projects under a Supervised Construction Program, under the provisions of 10 CSR 60-10.010(2)(C)2., are not required to obtain approval prior to construction.

As required by 10 CSR 60-10.010(4), all construction work must conform to approved plans and specifications. If changes are made that will affect the water quality, capacity and sanitary features or performance of the system, revised plans and specifications with a written explanation must be submitted to the department for review and approval before the changes are constructed. Minor revisions not affecting the water quality, capacity and sanitary features or performance of the system will be allowed without prior approval, provided as-built plans documenting these changes are submitted to the department.

Prior to the inspection, obtain the engineering project file for the approved project and review the approval report, plans and specifications to become familiar with the project. While on site, observe the project components under construction and determine if the approved plans and specifications are being followed. Also, observations should be made to determine that the American Water Works Association (AWWA) Standards and the federal Occupational Safety and Health Administration (OSHA) regulations outlined in the design guide are being followed. For DWSRF projects, make certain to obtain copies of all change orders on the project. Be sure to ask for any proposed change orders, as they may affect the contract completion.

Reporting
Use the Report of Construction Inspection form to document inspection observations. Use the Record of Construction Inspection form for DWSRF construction projects. Where appropriate, take pictures of the work in progress. A written report, cover letter and copy of the form should be provided to the municipality, water district, or owner indicating any problems observed during the inspection. Send copies to the Public Drinking Water Branch and the project engineer, and file a copy in the appropriate system file.

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3.3.5 Final Inspections

Purpose
The purpose of the final inspection is to examine a completed project to assure that it was constructed essentially in accordance with the approved plans and specification. Another purpose is to examine the project as to features of construction that may affect the operation of the facilities, including size, capacities of various units and features that may affect the safety, efficiency and ease of operation. The final inspection is the basis for final construction approval.

Forms
- Public Water System Record
- Groundwater Supply Record
- Point Locational Data Collection Sheet
- Inventory Public Water System Record – Form #1 [MO 780-1231](8-96)
- Inventory Address Data – Form #2 [MO 780-1232] (8-96)
- Inventory Source and Treatment Record – Form #3 [MO 780-1233] (8-96)
- CT Calculations for Surface Water Plants
- Technical, Managerial and Financial Capacity Assessment Checklist
- Bacteriological Water Analysis sample card [MO 580-0751] (4-04)
- Application for Permit to Dispense Water
- Emergency Operation Plan [see various model plans and forms online at http://www.dnr.mo.gov/env/wpp/eop/index.html]
- Microbiological Sample Siting Plan for Public Drinking Water Systems
- GWUDISW Determination Checklist for Public Water Systems (Groundwater Under Direct Influence of Surface Water)
- Water Treatment System and Water Distribution System classification worksheets

Equipment
In addition to the equipment listed in section 3.1 of the General Inspection Procedures chapter, the following is a listing of equipment that may be needed for specific types of final inspections of public water systems.
- Testing equipment - Hach DREL 2400 Spectrophotometer, chlorine colorimeter, pressure gauge, iron test kit, hydrogen sulfide test kit, etc.
- Sampling supplies – bacteriological water analysis card, microbiological sample bottles, rubber bands, cooler, propane torch or bleach spray bottle to disinfect faucets (plus shipping bottles and mailing labels if sending to the lab by courier or postal service)
- Global Positioning System (GPS) unit

Introduction
Final construction approval must be obtained from the department for all projects for which approval is required before the project is placed into service. Final approval may consist of a final inspection completed by the department, or the department may provide approval based on the certification of the project engineer. The Design Guide for Community Water Systems requires that upon completion of the construction project the engineers must certify in writing that the construction is substantially completed in accordance with approved plans and specifications and change orders.

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Generally, regional office engineering staff will conduct final construction inspections in the field of all major facilities, including new or modified water treatment plants, water intakes, water sources, pumping stations, finished water storage facilities, major distribution system configurations and expansions and Drinking Water State Revolving Fund (DWSRF) construction projects. The DWSRF coordinator will provide a list of DWSRF projects needing final inspection. Regional engineering staffing levels do not always allow for on-site final inspections for minor water main extensions. If this is the case, once the engineer submits certification, the project final approval may be provided via a form letter.

Because certifications are not submitted for all projects, regional offices may choose to track projects and note those projects that are more than two years old but that have never been issued a final approval. These systems can then be contacted to determine the project status, i.e., was the project constructed and was it done according to plans and specifications. If construction of the project has not started, a letter should be sent notifying the system that the construction permit has expired and that the project cannot be constructed without obtaining another "Approval to Construct" from the Public Drinking Water Branch. If the construction is complete, a final approval may be written based on certification by the appropriate system official that the construction was done in accordance with the approved plans and specifications or, upon the submittal of as-built plans and final pay estimates giving a listing of materials installed.

Procedure

Prior to the field inspection, obtain the engineering project file for the project and review the approval report, plans and specifications to become familiar with the project. For existing systems, review inventory information printed from the state Safe Drinking Water Information System (SDWIS) for confirmation and correction during the inspection. For new systems, the appropriate forms should be obtained for permitting the system and signing them up as an active system.

Prior to the field inspection, contact the project engineer and the system operator and set a date and time to conduct the inspection. Request shop drawings on all water storage facilities, treatment plants and pumping stations. Request operations manuals for treatment plants and pumping stations. Request as-built plans on treatment plants, intakes and distribution system expansions, and request final pay estimates on distribution system expansions. Explain that a final approval will not be issued until the requested drawings, manuals and other information are provided. Explain that the final approval acts as the permit to operate the specific facility and is required by regulation.

Explain that you want to make certain that chemical feeders, pumps and similar equipment will operate at their designed capacity. Also determine if problems will be caused if equipment is operated at its maximum capacity for short periods. Furthermore, make certain that facilities are available to easily determine the output of each piece of equipment.

While on site, observe the project components constructed and determine if the approved plans and specifications were followed. Where appropriate, take pictures of the completed work. Conduct appropriate testing or sampling and obtain all of the information needed to complete the appropriate forms based

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on the type of facility being inspected. Locate the site of the new components by Global Positioning System (GPS) unit or on a topographical map.

Reporting
During the inspection, fill out a Public Water System Record form. Either a new or revised form must be completed, and copies filed in the appropriate system files. If a new well or modification to an existing well is involved, request driller logs, pumping records and pump curves and fill out a Groundwater Supply Record form. A new or revised form must also be completed and copies filed in the appropriate system files.

Complete the appropriate inventory forms for existing systems with modifications and new systems to be activated. Complete the forms for permitting new systems required by the Public Drinking Water Branch Permitting Section. Complete the Technical, Managerial and Financial Capacity Assessment Checklist for all new systems commencing operation after October 1, 1999 so that they will be eligible to obtain a Permit to Dispense. Commencing operation means when they first start serving water as a public water system and this should be based on their activation date as a public water system. Send copies of all the forms to the Public Drinking Water Branch and file the originals in the appropriate system file.

Within 30 days of the date of the inspection, write a Report on Final Approval and draft a standard cover letter using the format provided by the Public Drinking Water Branch. The description of the facilities in the report must be detailed as to the size, type and capacity of important equipment such as treatment units, mixing basins, mixers, settling facilities, feeders, filters, pumps, sludge handling facilities and storage facilities. In addition, the description must include the legal location by quarter-quarter sections of each new well, lake, storage facility and pumping facility. Provide comments in the report for items needed to complete the process for obtaining a Permit to Dispense. Once a Final Approval is written, remove the project plans and specifications from the pending files. Prune the specifications to remove any unnecessary information and dispose of any duplicate plans by following office procedures. Then submit the plans and specifications for filing as a completed project. Once approved, copies of the final approval will be sent to appropriate system officials, the project engineer, the Public Drinking Water Branch and the appropriate system files. If an on-site final construction inspection for a minor water main extension is conducted, write a Report on Final Approval and draft a standard cover letter using the format provided by the Public Drinking Water Branch. The description of the facilities in the report must describe the location of the mains by street name if in a town or subdivision, or by legal description if in a water district. Prune the specifications to remove any unnecessary information and dispose of any duplicate plans by following office procedures. Then submit the plans and specifications for filing as a completed project. Once approved, copies of the final approval will be sent to appropriate system officials, the project engineer, the Public Drinking Water Branch and the system approval file.

3.3.6 Compliance and Operational Inspections

Purpose
This procedure is to establish a uniform procedure for conducting Compliance and Operational (C&O) Inspections of public water systems (PWS) and is part of the Field Services Division Operations Manual.

The primary objective of this procedure is to produce a reference document that will aid in completion of the C&O Inspection work product and will ensure consistency and completeness of the inspection and report.

Forms
- Compliance & Operational Inspection form [MO 780-1617](2-01)
- CT Calculations for Surface Water Plants
- Technical, Managerial and Financial Capacity Assessment Checklist
- Bacteriological Water Analysis sample card [MO 580-0751] (4-04)
- Emergency Operation Plan [see various model plans and forms online at http://www.dnr.mo.gov/env/wpp/eop/index.html]
- Microbiological Sample Siting Plan for Public Drinking Water Systems
- Application for Permit to Dispense Water (Operating Permit)
- Application for Transfer of Operating Permit
- Application for a Construction Permit [MO 780-0701] (9-96)
- Point Locational Data Collection Sheet
- GWUDISW Determination Checklist for Public Water Systems (Groundwater Under Direct Influence of Surface Water)
- Inventory Public Water System Record – Form #1 [MO 780-1231](8-96)
- Inventory Address Data – Form #2 [MO 780-1232] (8-96)
- Inventory Source and Treatment Record – Form #3 [MO 780-1233] (8-96)
- Water Treatment System and Water Distribution System classification worksheets
- PTS Tracking Slip PDWB – FY2006 (production tracking system)(date revised specific to each regional office)

Equipment
In addition to the equipment listed in Section 3.1 of the General Inspection Procedures chapter, the following is a listing of equipment specific to C&O Inspections of public water systems.

- Testing equipment - Hach DREL 2400 Spectrophotometer, turbidity test kit, chlorine colorimeter, pressure gauge, iron test kit (optional), hydrogen sulfide test kit (optional)
- Sampling supplies – bacteriological water analysis card, microbiological sample bottles, rubber bands, cooler, propane torch or bleach spray bottle to disinfect faucets (plus shipping bottles and mailing labels if sending to the lab by courier or postal service)
- General tools – flashlight, tape measure, wrench, pliers, screwdriver, watch or stopwatch
- Spotting scope
- Global Positioning System (GPS) unit
- Spare batteries for all equipment

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- Maps to site, public water system contact name and phone number, public water system inventory information to verify, copies of the last inspection report

Introduction

A C&O Inspection is categorized in the Public Drinking Water Program Inspection and Enforcement (I&E) Manual as a Class 2 inspection. As such, it is an on-site visual observation of pertinent facility components and records that can be performed as the initial visit to a previously unknown facility, as a routine inspection, or as a priority inspection for follow-up to a Notice of Violation (NOV) or other enforcement actions. This shall include review of system physical facilities and equipment, administration and record keeping, training of operators, sampling techniques, monitoring activities for water quality, design and reliability operations of the waterworks system, competency of the supplier of water, cross-connection control, security measures, and the emergency operation plans.

According to 10 CSR 60-1.010(3), drinking water activities in the regional offices include "surveillance and evaluation of the adequacy and condition of public water systems at a frequency to be determined by the department." Regulation and the State/EPA agreement set the frequency of inspection. This is once in three years for water systems with filtration treatment, once every five years for all other community systems, and once every 10 years for all other non-community systems. An exception to this frequency is the department's requirement to inspect regulated state parks on an annual basis.

Selection of facilities for inspection is a cooperative effort between the Public Drinking Water Branch (PDWB) and regional offices. While the level of input by the PDWB will vary from region to region, it is primarily the responsibility of the region to ensure that the inspection rotation is sufficient to meet the federally mandated three-, five-, and ten-year inspection frequencies.

Pre-Inspection Procedures

Once a system has been selected for inspection, preparation can begin by printing available information maintained in the state Safe Drinking Water Information System (SDWIS) for confirmation and correction during the inspection. This must include the inventory information, but may also include the system's sampling record and violation history for the last 12 months. For direction on where to find and print this information, contact the SDWIS Administrator at the Public Drinking Water Branch or refer to the most recent version of the SDWIS/State User's Guide.

This is followed by a file review for pertinent information for use during the inspection. It will be necessary to know the classification of the system (transient non-community (TNC), non-transient non-community (NTNC) and community (C)) to know what information exists. At a minimum, this shall include any Reports of Low Pressures, the last 12 months' microbiological history, the most recent chemical and radionuclide history, the previous routine inspection or sanitary survey, and any enforcement action taken against the system. It is also advised that the inspector determine if a Permit to Construct has been issued in the last two years and that a photocopy be made of the last inspection schematic drawing for comparison to determine alterations of the system. If any deficiencies or concerns are found during this review, they shall be transferred onto the applicable

section of the C&O Inspection checklist to be taken to the field for use during the inspection. In order to maximize inspection time at the facility, the inspector completes as much of the checklist as possible before arriving at the facility.

The final steps in preparation for the inspection are to collect, organize, and test for operation all equipment required for the inspection [see Equipment section *(above, page 10)* for a listing of equipment]. The test for operation shall include calibration of equipment and checking expiration dates on any reagents and standards. Tests that must be performed during an inspection vary with the degree of treatment provided at each system. At a minimum, the compliance and operational tests required by the Safe Drinking Water Regulations are to be done to assure that the system operators are performing the tests correctly and accurately. For all water treatment systems with iron or manganese in the raw water, prepare to run tests for iron and manganese on the finished water and on filter influent and effluent water. For surface water and lime softening plants, perform sufficient analyses or collect sufficient information to do a stability analysis of the finished water using the Rothberg, Tamburini & Winsor Model, a computer program available from the American Water Works Association that calculates stability using three indexes. However, if a system does daily calcium carbonate stability tests, review the method, and if properly done accept the results of their test over the Rothberg, Tamburini & Winsor Model.

Depending upon the type of facility to be inspected, prior notification may be necessary. Many PWS such as condominiums, subdivisions, or small municipalities may be restricted from access and not have representatives on site. To ensure a successful and productive inspection, coordination with appropriate personnel is recommended. An additional effort that may facilitate the inspection is to mail or fax to the water system the list of records and information that must be available for review. For additional discussion of Pre-Inspection Preparation, see section 3.1 of the General Inspection Procedures chapter.

C&O Inspection Procedure

Generally, there is little need for a drive-by reconnaissance prior to inspection of a public water system. Should the inspector wish to view the layout of the facility or assess the distribution for features such as fire or flush hydrants before beginning the inspection, this shall be done from a public right-of-way. For a discussion of drive-by reconnaissance, site entry, and introductory briefing, see section 3.1 of the General Inspection Procedures chapter.

The C&O Inspection begins with a review of inventory information printed from SDWIS (see Pre-Inspection Procedures above, page 11). This is required during every inspection regardless of classification and type of water system, and will allow the inspector to confirm and, if necessary, correct information vital to conducting a successful inspection. Key information contained in the SDWIS Inventory printout for verification and correction includes:

- PWS Type (TNC, NTNC, C)
- Required Operating Level (for those systems required to have a certified operator)
- Season Begin and End (for seasonal systems only)
- Retail Population Served and Service Connections

- Facility Construction and Design data on the source, treatment and storage structures
- Sample site locations
- Contact names and addresses.

Corrections to this information shall be made directly onto the printout, and an offer to copy this printout made to the PWS representative. The corrected printout shall be provided to the SDWIS Administrator for data entry.

Following this review of SDWIS information, the inspector proceeds to the visual inspection of the facility. The inspector should perform this evaluation while accompanied by a PWS representative most knowledgeable about the system, such as the chief operator. Questions about the facility construction, operation, and maintenance are to be directed to the representative while evaluating the components of the facility. Ask open-ended questions and lead the representative into a discussion of the facility.

Typically, a visual inspection of a PWS proceeds in sequence from source to distribution. During this sequenced evaluation, the inspector will develop a schematic drawing of facility components and associated appurtenances using recognized symbols. Where possible, manufacturer and model numbers of critical equipment, specifications, and dimensions shall be recorded on this drawing.

Violations and design guide deficiencies noted during this evaluation shall be noted at the time of observation, and recorded in the appropriate location on the checklist. As additional documentation, the inspector shall take sufficient photographs necessary to clearly identify and thoroughly document his observations. The position and direction of each photograph shall be located on the schematic drawing using numbers corresponding to those on the camera. The content of each photograph shall be described and catalogued on the checklist.

Also during this sequenced evaluation, the inspector shall take Global Positioning System (GPS) readings on those sources, pumping stations, water treatment plants, and water storage facilities that have not already been located. GPS readings shall be taken using assigned equipment and following established protocol for data collection and documentation to appropriate personnel.

Before beginning discussion of the visual inspection procedure, a familiarization and understanding of the inspection forms is helpful.

Compliance and Operational Inspection Checklist
The C&O Inspection checklist is a five-page form with the first page used to record inspection date, system ID number, name, address, and telephone number, and the representative(s) interviewed during inspection. It also provides an area for comments and recommendations for correction where the inspector can provide narrative notes and discussion corresponding to the item number(s) marked for comment on the remaining four pages. At the bottom of this page are blanks for the inspector's signature and title, a place to record free and total chlorine residual, and whether a sample was collected and its location.

The remaining four pages are divided into eight major categories identified as:

- Item #1 Administration
- Item #2 Source
- Item #3 Pumping Stations
- Item #4 Storage
- Item #5 Distribution
- Item #6 MCL/Monitoring
- Item #7 Disinfection
- Item #8 Treatment

Each of these eight major categories is further divided into subcategories, with each of these containing various numbers of items for evaluation of compliance with regulation and design guide. The individual items that evaluate regulatory compliance are in **bold** print and are provided with the regulatory citation; those evaluating non-regulatory design guide or operation and maintenance recommendations are in regular print.

Beside each category and subcategory is a box to indicate Not Applicable (NA), and beside each individual item the inspector can choose between C (comment), OK, or NA. If the item is marked for comment, the corresponding item number is transferred to the first page and a narrative description of the inspector's observation is made. Every item marked for comment must have a corresponding narrative description.

On page five is a half-page blank field that can be used for the schematic drawing. If more room is needed, the reverse side is available.

C&O Inspection procedures are in part determined by the classification (TNC, NTNC, C) and type (groundwater vs. surface water) of water system. In general, many of the **Item #1 Administration** and **Item #6 MCL/Monitoring** requirements apply to all water systems and can be completed during the pre-inspection file review, but the remaining sections are system specific to be completed during the visual inspection. Please note that a Missouri Supreme Court decision handed down in 1996 prohibits the department from collecting the Laboratory Services and Program Administration Fee (10 CSR 60-16.030) from publicly-owned public water systems. (See Missouri Municipal League v. State, 932 S.W.2d 400 (Mo.banc) and section 640.100, RSMo, footnote.) This includes, for example, public water systems owned by cities and public water supply districts.

The following is a suggested C&O Inspection procedure in sequence from source to distribution. The order and design of the procedure may be altered to fit the size and complexity of the facility being inspected.

Item #2 Source

The beginning component of any primary PWS is the source. Source is divided into four subcategories on the C&O Inspection checklist (Groundwater, Reservoirs, Rivers and Streams, and Intakes), each of which contain various numbers of items for evaluation of compliance with regulation and design guide.

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Groundwater

The first subcategory, Groundwater, is evaluated using Items 201-207 (regulatory) and 208-234 (design guide). Groundwater sources share much of the same design and features irrespective of classification (TNC, NTNC, C) and size, so the design and features of the largest community well are not much different than the smallest transient well.

Approximately 45 percent of the water used in the United States comes from groundwater sources. There are two types of groundwater sources or wells that need to be evaluated during the visual inspection of a PWS. The first is the bedrock well, which penetrates competent bedrock formations to reach a water-bearing formation(s) (aquifer); the second is an alluvial well, which penetrates the water table and maintains a sustained yield from the overlying unconsolidated materials. The bedrock wells are primarily confined to the southern half of the state, and the alluvial wells are generally located in the unconsolidated materials along large rivers (Missouri and Mississippi) and in the glacial till of northern Missouri.

Typically, a bedrock well consists of a borehole, casing (inner and outer), grout seal between the borehole and casing, pump (either submersible or vertical shaft turbine), wellhead, wellhead seal, vent, check valve, and other appurtenances as specified by the applicable design guide. It is important that the inspector be familiar with these design guide recommendations so that a thorough evaluation can be performed. Pay particular attention to the equipment and conditions that are necessary to maintain the sanitary integrity of the wellhead –- specifically, Items 215, 217, 218, 219, 226, 230, and 232 of the checklist. If any of these are found deficient, the sanitary integrity of the wellhead may be compromised, and deserves comment not only under the specific item(s) but also under the regulatory Item 204-Sanitary Construction Defect.

In addition, if you find an upturned vent in association with piping, well seal, or casing that exhibits an inordinate amount of corrosion, this may signify the PWS is hand-chlorinating the well. Investigate by testing for chlorine residual in the raw water and through interview of the PWS representative.

If the well is equipped with drawdown measuring equipment, the inspector will evaluate the operability and use of this equipment. As a lack of rainfall or an ever-increasing demand on groundwater lowers the water table in many areas of the state, the importance of this equipment for measuring the water table cannot be overstated.

The alluvial well, while sharing many of the same designs and features, is different in that the water-bearing aquifers consist of numerous layers of sand and gravel deposits. In many localities, formations of sand and gravel are the only water-bearing formations of sufficient yield available to a PWS. Properly designed and constructed wells can be drilled in these types of formations that produce high yields, but must be routinely removed from service for cleaning and redevelopment. Therefore, all water systems served by alluvial wells shall have more than one well and shall be capable of meeting maximum day demand with the largest producing well out of service. The design features of an alluvial well differ from the bedrock well, so it is important that the inspector know the recommendations of design guide so that a thorough evaluation can be performed.

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Reservoirs
Reservoirs are natural or artificial ponds or lakes used for the storage and regulation of water. Although groundwater is generally considered the preferred source for drinking water, conditions in many areas of the state do not allow for its use. Reservoirs are commonly used in these areas.

For surface water systems using lakes, inspect each lake that supplies water to the system including upper lakes that discharge to lower lakes and lakes used mainly as emergency sources. Find out if each lake has stadia markings to determine water levels and if the operators are keeping records of the levels. For systems with earthen raw water storage reservoirs, inspect the embankments forming the reservoirs as if they were dams using the appropriate sections of the checklist in the Missouri Dam and Reservoir Safety Council's publication "Maintenance, Inspection and Operation of Dams in Missouri" (1991). Determine if the system has a watershed management program.

Rivers and Streams
Rivers and streams are less desirable as a source of surface water than reservoirs since the quality of the water can vary greater and can cause difficulties during the treatment process. However, in many areas these are the only source of drinking water that is available.

For surface water systems using rivers or streams, it is important to inspect the raw water intakes and associated pumping stations.

Intakes
Intakes are the portion of the water system where raw water is initially pulled from a reservoir, river or stream into the treatment portion of the system. Intakes must be properly located so that they draw the highest water quality possible and in some systems their location may be adjusted over time as conditions change.

Water intakes in lakes should be inspected to ensure that the intake levels are variable. Inspection notes will include the level that the operator is currently drawing water from. For intake towers, question the operator as to which intakes he uses and the last time the different intake valves have been used. Determine if any low or high flow problems or cold weather problems affect the ability of the intake to function adequately.

Item #3 Pumping Stations, Raw & Finish Water Pumping, Finished Water Pumping
When inspecting pumping stations, determine hours of operation and pumping rates to assess capacity. By interviewing the operator, determine if any low or high flow problems or cold weather problems affect the ability of the pumping station to function properly. For systems that use streams and rivers to pump to lakes, find out if they have a pumping plan designating when they pump, and what levels they are trying to maintain in the lake(s).

Item #7 Disinfection
While not in the order presented in the C&O Inspection checklist, disinfection and treatment are commonly the next components to evaluate in the sequence from source to distribution. Disinfection and treatment will be described separately, even though disinfection is often a stage of the overall treatment strategy.

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Disinfection is the means by which a public water system controls microbiological contaminants through the selective destruction or inactivation of pathogenic organisms in the raw water source or in finished water while in storage or distribution. This can be accomplished either physically or chemically.

Physical methods include ultraviolet (UV), heat, and removal through water treatment processes such as coagulation, sedimentation, and filtration. However, physical methods do not protect the water beyond the point of application, i.e., do not provide "residual" protection of the finished water while in storage or distribution. Further discussion of physical methods will be reserved for the "Item #8 Treatment" discussion (page 18, below), with the exception of saying that ultraviolet (UV) treatment is occasionally installed on small systems on a "voluntary" basis. Because the design guides do not recognize it, UV cannot be accepted as fulfilling a mandatory requirement for disinfection.

Chemical methods include the use of calcium or sodium hypochlorite, gas chlorine, chloramines, chlorine dioxide or ozone, all of which disinfect by altering the cell chemistry causing the microorganism to die. Of these, sodium hypochlorite and gas chlorine are the most often-used disinfecting agents.

The regulatory requirements for disinfection are evaluated using Items 701-711. Items 701, 702 and 703 are evaluating for minimum and maximum chlorine residuals in the system, and while this can be accomplished by reviewing the PWS chlorine residual records, it is recommended that the inspector test and verify for chlorine residuals. Specifically, the inspector will verify a minimum free available chlorine of 0.5 milligrams per liter (mg/L) or free available chloramines 1.0 mg/L in water entering the distribution system, and a minimum total chlorine of 0.2 mg/L and a maximum total chlorine or chloramines of 4.0 mg/L in the distribution system. Application of these requirements shall be made on every disinfected PWS even though they are technically not applicable unless the department required that disinfection be installed (10 CSR 60-4.055(1)). Should the PWS dispute the citation on the grounds that disinfection was installed voluntarily, the PWS shall be formally advised by letter that disinfection is hereby required and the requirements of regulation apply.

Liquid Chlorinator

Liquid chlorine is typically found as 5.25 percent solution (common household bleach) or a 12.5 percent solution (industrial grade bleach) of sodium hypochlorite (NaOCl). This solution is fed into the source water stream from a chlorine solution tank using a chemical metering pump through an injector positioned in the source water pipe and upstream of any storage facility.

Evaluation of the liquid chlorinator for compliance with design guide recommendations shall be made using Items 712-718 of the checklist. Again, it is important that the inspector be familiar with and understand these recommendations so that a thorough evaluation can be performed. Pay particular attention to the equipment and conditions that are necessary to ensure a consistent delivery of chlorine solution, and that sufficient detention has been provided for inactivation of the pathogenic organisms.

In addition to the items listed on the checklist, other things to watch for that will affect the operation and effectiveness of a liquid chlorinator are:

- Excessive buildup of precipitates in bottom of solution tank.
- Metering pump suction line lying on bottom of solution tank where precipitates accumulate.
- Metering pump suction line is not vertical and has accumulated a chlorine gas bubble that has caused metering pump to lose prime.
- Injector is plugged with mineral precipitate buildup (injector should be positioned midway into the source water pipeline so the force of passing water will aid in cleaning and removal of mineral precipitate buildup). Injector should be tapped into the source water piping in such a way that the injector can be withdrawn from the pipe and a valve provided on the injector topping saddle to enable shut off while the injector is being serviced or replaced.

Gas Chlorinator

Chlorine is a greenish-yellow gas with a penetrating and distinctive odor. It is two and one-half times heavier than air, has a very high coefficient of expansion, and is non-flammable and non-explosive but will support combustion. Most importantly for the inspector, chlorine gas is extremely toxic. Small amounts in the air will combine with moisture in the eyes, nose, throat and lungs to be very irritating and cause severe coughing. Concentrations in excess of 1,000 ppm (0.1 percent by volume in air) may be fatal after a few breaths. Under no circumstances will department personnel enter a chlorination or scale room if there is any reason to believe that gas may be present, and is recommended that the visual evaluation of the chlorination and scale room be performed from the outside.

Evaluation of the gas chlorinator for compliance with design guide recommendations shall be made using Items 719-736 of the checklist. Unlike liquid chlorinators, there is little to inspect to ensure the consistent delivery of gas chlorine. More important will be the safety and security features of the chlorine room and cylinder storage.

Item #8 Treatment

Without treatment, raw water may not be suitable for drinking. The type of treatment that is needed depends on the chemical, physical and biological makeup of the water. Because surface water sources are open to physical and biological contamination, they will generally require more in-depth treatment than groundwater sources and at a minimum must include filtration and disinfection. Except in limestone areas, groundwater is less likely to have pathogenic organisms than surface water, but may contain mineral impurities that lead to unpleasant tastes and odors. Although not required, treatment is often employed by water systems for these types of issues. Source water quality constantly changes and system operators must ensure control of the various treatment systems through specified regulatory testing procedures. Generally these tests are performed as operational tests at the site, but for some treatment processes, such as fluoridation, samples must be collected and submitted to the department or a certified lab for testing.

Tests that must be performed during an inspection vary with the degree of treatment provided at each system. At a minimum, the compliance and operational tests required by the Public Drinking Water Regulations will be done to assure that the system operators are performing the tests correctly

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and accurately. An exception to this is tests for chlorine dioxide and chlorites because the equipment to perform these tests is not portable. For those systems using chlorine dioxide, review the system testing procedures to see that tests are being performed correctly. For surface water and lime softening plants this generally will require tests for pH, free and total chlorine, alkalinity, hardness and turbidity on the finished water.

For surface water plants, test the finished water for turbidity and free and total chlorine residuals. Review the plant records and obtain finished water pH, hardness, alkalinity and stability information.

Item #4 Storage
Following disinfection and treatment (if provided), the next component to evaluate in the sequence from source to distribution is storage. Storage is an essential component of the distribution network whose purpose is to serve as a buffer between source capacity and water supply demands. Storage also serves to equalize operational water pressures, provide storage during off-peak periods, and provides a protected reserve of drinking water in case of source or treatment maintenance and shutdown. An important secondary consideration is storage for fire protection.

Storage is divided into unpressurized and pressurized subcategories in the C&O Inspection checklist. Since storage may take many forms, the items listed for evaluation under each of these subcategories may not be applicable in every situation. As with previously described components in a PWS, it is important for the inspector to know and understand the recommendations of the design guides so a thorough evaluation can be performed.

To determine the adequacy of storage, it is important to obtain the water usage and total storage volumes on all but the smallest PWS. In an unpressurized storage system, it is recommended that the PWS have a minimum of one day's usage in usable storage. If the PWS does not maintain usage information, the minimum volume of usable storage can be calculated using the population served times water usage values provided in the design guides. In a pressurized storage system, it is recommended that the PWS have a minimum usable volume of 6.25 gallons per person served (this is equivalent to 35 gallons gross volume per person served when the pressure range is 40-60 psig).

Unpressurized Storage
Unpressurized storage is the most economical and efficient means of storing large volumes of finished water. Storage structures may take the form of elevated, standpipe, ground level, covered reservoir and clear well tankage, and range in size from a few hundred gallons to in excess of one million gallons. Because unpressurized storage is where finished water is intentionally open to the atmosphere, the importance of evaluating tank integrity and sanitary protection cannot be overstated. Defects in the storage vessel, roof hatch, vent, or overflow pipe/screen/flap valve will compromise the tank integrity, and can lead to microbiological contamination and waterborne disease outbreaks. (A gap in the roof hatch in Gideon, Missouri resulted in an estimated 650 cases of diarrhea and seven nursing home patients dying from diarrheal illness. Source: American Journal of Public Health, v. 87(4), p. 580-584, F.J. Angula, author).

Unpressurized storage is evaluated using Items 401-403 (regulatory) and 404-421 (design guide). Pay particular attention to the equipment and conditions that are necessary to maintain the sanitary integrity of the storage structure. Specifically, Items 405, 406, 407, 411 and 414. If any of these are found deficient, the sanitary integrity of the storage structure may be compromised and deserves comment not only under the specific item(s) but also under the regulatory Item 403 (Sanitary Defect).

Because the inspector is prohibited from climbing storage structures to evaluate many of the items listed on the checklist, each regional office has been provided spotting scopes to inspect as much of the tank as possible from vantage points away from the structure. However, much of the evaluation must still be determined by interviewing the PWS representative and through review of the most recent tank inspection report. Sanitary defects identified by the report that have not been repaired or addressed shall be noted as an unsatisfactory feature, even when not confirmed by the inspector. Repairs must be documented through work orders, invoices, statements of work completed, photographs, etc. to be accepted as evidence of compliance.

Pressure Tanks

Unlike unpressurized storage, pressure tanks by their design must be a sealed vessel not open to the atmosphere, so the opportunity for microbiological contamination of a pressure tank is very small. In fact, the only potential pathway would be through the air cushion recharge by the compressor (hydropneumatic tank only). Instead of concentrating on sanitary defects, the visual evaluation of a pressure tank will be looking at the operational controls and maintenance of the tank. Operational controls include Items 423, 425, 426, 427, and 428. All the operational controls in this listing are intended to maintain the pressure tank at its optimal air cushion/water seal ratio and prevent the tank from becoming waterlogged (Item 432).

A bladder tank is a type of pressure tank that is intended to serve primarily as pump control and not for storage. However, bladder tanks will often be the only storage used for non-community and small community water supplies. If this is the case, they shall have a usable volume sufficient to store at least two minutes' discharge from the largest supplying pump. By their design, bladder tanks cannot be counted as providing disinfection contact time because they are connected to the system with a single inlet/outlet pipe and do not provide flow-through detention.

Item #5 Distribution

The last component in the visual evaluation of a public water system is distribution. The purpose of a distribution system is to deliver to each consumer safe drinking water that is also adequate in quantity and acceptable in terms of taste, odor, and appearance. As with other components of a public water system, the size, extent, and complexity of the distribution can vary greatly, from a small-diameter, single line from tank to drinking water fountain, to hundreds of miles of various diameter mains, fire hydrants, valves, auxiliary pumping or booster chlorination substations, distribution storage facilities and service lines.

The role of the inspector is to evaluate proper construction, operation, and maintenance of the distribution system. The evaluation of proper construction is usually the role of a construction inspection. However, construction features are addressed in the C&O Inspection checklist using Items 501-504

(regulatory) and Items 505-508 (design guide, operation and maintenance). Equally important to the quality of water is the operation and maintenance of the distribution system. Water released into the distribution system becomes altered during its passage through pipes and distribution storage facilities, so the optimum situation would be to utilize finished water within 24 hours of production. Unfortunately, this seldom happens, so careful attention to protocols for repair of line breaks, corrosion control, new line acceptance, water storage, and water main flushing can go a long way toward improving the quality of water in distribution. Evaluation of proper operation and maintenance of the distribution system shall be made using Items 501 and 502 (regulatory), and 505 and 506 (design guide), plus the operation and maintenance Items 135-143 under the **Item #1 Administration** section of the checklist.

It is during this evaluation of the distribution system that the inspector collects microbiological samples. While these samples can be collected from anywhere within the distribution system, it is suggested that they be taken from a location of the PWS representative's choosing, thereby removing any question of adequacy of the sampling point. For a discussion of microbiological sampling protocol, see Appendix SC in the Missouri Department of Natural Resources Public Drinking Water Program Inspection and Enforcement (I&E) Manual.

Item #1 Administration

The final item for evaluation during routine inspection of a public water system is identified in the C&O Inspection checklist as "Item #1 Administration". This category is divided into Items 101-134 (regulatory) and Items 135-143 (optional). The regulatory items address requirements as diverse as *"Permit to Dispense"* to *"Sludge Management Permit or Plan"*, whereas the optional items are primarily operation and maintenance records pertaining to the distribution system.

It is important the inspector understand the regulations in order to know what items to apply. To assist in this understanding and application of regulation, refer to the following table. It is recommended the inspector use this table to identify on the C&O Inspection checklist the items that are not applicable for the classification and type of system to be inspected.

ITEM #1 ADMINISTRATION	Groundwater			GWUDI			Surface Water		
	TNC	NTNC	C	TNC	NTNC	C	TNC	NTNC	C
101. Permit to Dispense Status 10CSR60-3.010	X	X	X	X	X	X	X	X	X
102. Construction Permits 10CSR60-3.010(1)(A)	X[1]	X	X	X	X	X	X	X	X
103. Final Approvals 10CSR60-3.010(1)(B)	X[1]	X	X	X	X	X	X	X	X
104. Owner Supervised Program 10CSR60-10.010(2)(C)			X[2]			X[2]			X[2]
105. Certified Chief Operator 10CSR60-14.010(4)		X	X	X	X	X	X	X	X
106. Emergency Operations Plan 10CSR60-12.010			X			X			X
107. Lead Ban Ordinance 10CSR60-10.040	X	X	X	X	X	X	X	X	X
108. Backflow Prevention Program 10CSR60-11.010			X			X			X
109. Backflow Device Records 10CSR60-11.010(7)(B)			X			X			X
110. Primacy Fees 10CSR60-16.010			X			X			X
111. Laboratory & Administration Fees 10CSR60-16.030	X[3]	X[3]	X[3]	X[3]	X[3]	X[3]	X[3]	X[3]	X[3]
112. Coliform Sampling Plan 10CSR60-4.020(1)(A)	X	X	X	X	X	X	X	X	X
113. Pb/Cu Sampling Plan 10CSR60-15.070		X	X		X	X		X	X
114. Turbidity Reporting 10CSR60-7.010(4)				X	X	X	X	X	X
115. Disinfection Reporting 10CSR60-7.010(5)	X[4]	X[4]	X[4]	X	X	X	X	X	X
116. Private Lab Coliform Results 10CSR60-7.010	X[5]	X[5]	X[5]	X[5]	X[5]	X[5]	X[5]	X[5]	X[5]
117. Public Notification Requirements 10CSR60-8.010	X	X	X	X	X	X	X	X	X
118. Exemption/Variance Requirements 10CSR60-6.030	X	X	X	X	X	X	X	X	X
119. Sludge Management Permit or Plan 10CSR20-8.170	X[6]	X[6]	X[6]	X	X	X	X	X	X
120. NPDES Permit on Plant Discharge 10CSR20-6.010(5)	X[7]	X[7]	X[7]	X	X	X	X	X	X
121. Monitoring Reports Due by 10th 10CSR60-7.010(1)	X	X	X	X	X	X	X	X	X
122. Reporting Regulation Violations 10CSR60-7.010(2)	X	X	X	X	X	X	X	X	X
123. Reporting DBP & IESWTR 10CSR60-7.010(6)	X[4]	X[4]	X[4]	X[8]	X	X	X[8]	X	X
124. Enhanced Filtration & Disinfection Reporting 10CSR60-7.010(7)				X	X	X	X	X	X

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ITEM #1 ADMINISTRATION (continued)	Groundwater			GWUDI			Surface Water		
125. DBP Monitoring Plan 10CSR60-4.090(3)		X[4]	X[4]		X	X		X	X
126. Reporting for Lead & Copper 10CSR60-7.020(4)		X	X		X	X		X	X
127. Coliform Results (5 yrs.) 10CSR60-9.010(1)(A)	X	X	X	X	X	X	X	X	X
128. Operational Records 10CSR60-9.010(1)(A)	X	X	X	X	X	X	X	X	X
129. Chemical Results (10 yrs) 10CSR60-9.010(1)(A)	X	X	X	X	X	X	X	X	X
130. Violation Actions (3 yrs) 10CSR60-9.010(1)(B)	X	X	X	X	X	X	X	X	X
131. Inspection Reports (10 yrs) 10CSR60-9.010(1)(C)	X	X	X	X	X	X	X	X	X
132. Variance/Exemption Records (5 yrs) 10CSR60-9.010(1)(D)	X	X	X	X	X	X	X	X	X
133. Consumer Confidence Report (CCR) CFR 141.153			X			X			X
134. Any System Records Requested 10CSR60-9.010(2)	X	X	X	X	X	X	X	X	X

1. May be required, at the discretion of the department, to submit plans and specifications for approval (10CSR60-3.010(2)(B)2.
2. Is optional for water distribution system only; does not include source, treatment, or storage facilities.
3. A Missouri Supreme Court decision handed down in 1996 prohibits the department from collecting the Laboratory Services and Program Administration Fee (10 CSR 60-16.030) from publicly-owned public water systems. (See Missouri Municipal League v. State, 932 S.W.2d 400 (Mo.banc) and section 640.100, RSMo, footnote.) This includes, for example, public water systems owned by cities and public water supply districts.
4. If a disinfectant is added
5. If a private laboratory is used
6. Only for treatment where a sludge is generated
7. Only for treatment where a discharge occurs
8. If using chlorine dioxide as a disinfectant or oxidant

Upon completion of the visual inspection and record review, the inspector will provide the PWS representative a summary of the preliminary findings of the inspection, answer non-interpretative technical questions, and provide appropriate recommendations. During the exit briefing, the inspector shall advise that a written report of inspection will be forthcoming within the next 30 days. For a discussion of the Exit Briefing, see section 3.1 of the General Inspection Procedures chapter.

Reporting

Within 30 days of the inspection, a written report, cover letter and accompanying enclosures will be provided to the PWS, with a copy to the Public Drinking Water Branch and the file copy to the appropriate regional office system file. Fill out a Production Tracking System (PTS) data entry sheet and submit it to the appropriate regional office personnel for entry into PTS. Also submit any necessary documentation to the Public Drinking

Water Branch, such as the C&O Inspection checklist, inventory changes, GWUDISW determinations, GPS readings, etc., to complete the inspection, with a copy of each going to the appropriate regional office system file.

Track and follow up on any deadlines, compliance dates or requests for responses that were put into the report. In the cover letter of each report request that the system officials respond in writing to the report within a specified time period explaining what the system intends to do to address the recommendations in the report. If a system has not responded within the time period specified, prepare a letter reminding the system officials of the request. If after the first reminder letter a response is not received, you may want to prepare a second reminder letter to be sent by certified mail.

Post-inspection procedures shall be in accordance with section 3.1 General Inspection Procedures and Chapter 3 of the Missouri Department of Natural Resources Public Drinking Water Program Inspection and Enforcement (I&E) Manual.

3.3.7 Technical Assistance Visit

Purpose
Technical Assistance Visits are conducted at public water systems (PWS) to help them with particular operational or compliance problems with their system or as a brief visit to determine progress made in correcting existing deficiencies.

Forms
- Technical Assistance Visit form [MO 780-1650](1-98)
- Operational Survey form [MO 780-1198] (12-89)
- Bacteriological Water Analysis sample card [MO 580-0751] 4-04), plus shipping boxes and mailing labels if sending to the lab by courier or postal service)
- Owners And Operators Handbook for Small Community Public Water Supplies date revised specific to Regional Office – original from JCRO, 11/5/02)
- Owners And Operators Handbook for Non-Community Public Water Supplies (date revised specific to Regional Office – original from JCRO 11/5/02)
- Procedures for Flushing, Disinfecting, and Testing Seasonal Public Water Supplies

Equipment
In addition to the equipment listed in 3.1 General Inspection Procedures, the following is a listing of equipment that might be necessary for a Technical Assistance Visit at a public water system.
- Testing equipment - Hach DREL 2400 Spectrophotometer, chlorine colorimeter, pressure gauge, iron test kit (optional), hydrogen sulfide test kit (optional).
- Sampling supplies – bacteriological water analysis card, microbiological sample bottles, rubber bands, cooler, propane torch or bleach spray bottle to disinfect faucets.
- General tools – flashlight, tape measure, wrench, pliers, screwdriver, watch or stopwatch.
- Digital camera

- GPS unit
- Spare batteries for all equipment
- Maps to site, public water system contact name and phone number, public water system inventory information to verify, copies of the last inspection report.

Introduction
A Technical Assistance Visit is categorized in the Public Drinking Water Program Inspection and Enforcement (I&E) Manual as a Class 2 inspection, along with the Compliance and Operational (C&O) Inspection. While these two inspections are similar in their on-site visual observation of pertinent facility components and records, a major difference is the Technical Assistance Visit is usually targeting operational needs of the public water system (PWS).

Another major difference is that the Technical Assistance Visit is either requested by the PWS, or less often is a follow-up to a more comprehensive inspection, a Notice of Violation (NOV), or other enforcement action, and therefore is targeting specific items of concern to either the PWS or the department. As such, the Technical Assistance Visit is usually not as comprehensive as the C&O Inspection.

Because the Technical Assistance Visit is usually a demand activity that concentrates on operational needs of the PWS, it is an activity that is often assigned to a Water Specialist trained and educated in the operations of a PWS.

Pre-Inspection Procedure
When contacted with a request for a Technical Assistance Visit, the inspector should arrange the place, time, and date for the visit. In addition, the inspector should identify the reason for the request to narrow the scope of the visit and pre-inspection preparation.

Preparation is similar to a Compliance and Operational (C&O) Inspection, but is usually more limited based on the assistance needed. For discussion of Pre-Inspection Procedures, see the Compliance and Operational Inspection chapter, 3.3.6.

Technical Assistance Visit Procedure
The Technical Assistance Visit is limited to the procedure and components identified by the requesting party. If the visit is intended as a follow-up to a previous inspection, NOV, or enforcement action, the evaluation will be limited to those unsatisfactory features and recommendations identified therein.

The forms listed for use during a Technical Assistance Visit by the I&E Manual are the Operational Survey form and Technical Assistance Visit form. These two checklists are essentially identical to one another, the only difference being that the Operational Survey form has a “Compliance Evaluation” section, whereas the Technical Assistance Visit form instead has a section for recording operational testing results (pH, Cl, alkalinity, hardness, turbidity, etc.) in the raw and finished water. In light of these differences, it is suggested the Operational Survey form be used if the visit is a follow-up to a previous inspection, NOV, or enforcement action, and the

Technical Assistance Visit form is most appropriate if the visit is by request from the PWS.

Unlike the C&O Inspection checklist that is extensive and detailed in its listing of regulatory, design guide, and operation and maintenance items, these forms are very generalized and list only major components or operational categories for evaluation. This generalized format is in keeping with the generalized and limited nature of the Technical Assistance Visit where just those sections that were either previously identified as non-compliant or requested by the PWS are to be evaluated.

Rather than describe all the major components or operational needs that may be a part of the Technical Assistance Visit, this procedure will refer the reader to the applicable discussion(s) in the C&O Inspection Procedure in the Compliance & Operational Inspection chapter above. In addition to the procedure referenced above, the inspector should consider using the Owners And Operators Handbook for Small Community Public Water Supplies or the Owners And Operators Handbook for Non-Community Public Water Supplies when assisting public water systems with understanding the monitoring requirements of regulation and response to unsafe samples. Another form that can be used to explain disinfection procedures is the Procedures for Flushing, Disinfecting, and Testing Seasonal Public Water Supplies. These informational forms can also be mailed to a PWS if a Technical Assistance Visit is not needed.

For a discussion of the Exit Briefing, see section 3.1.8 in the General Inspection Procedures chapter.

Reporting
The Operational Survey form and Technical Assistance Visit form are printed as carbonless triplicate forms. The yellow copy is to be provided to the public water system representative, the pink copy sent to the PDWB, and the white copy kept in the regional office file.

3.3.8 Sanitary Survey Inspections

Purpose
The purpose of the sanitary survey is to provide an on-site in-depth engineering inspection and review of a public water system, including its supply sources, treatment facilities and distribution system, for the purpose of evaluating their adequacy, reliability and safety for producing and distributing drinking water. The sanitary survey includes assessment of a system's technical, managerial, and financial (TMF) capacity as incorporated into the Record of Public Water System Sanitary Survey Checklist.

Forms
In addition to the Record of Public Water System Sanitary Survey Checklist, the following is a listing of forms that may be needed for specific types of sanitary surveys.

- Public Water System Record
- Groundwater Supply Record
- Point Locational Data Collection Sheet
- Inventory Public Water System Record – Form #1 [MO 780-1231] (8-96)

- Inventory Address Data – Form #2 [MO 780-1232] (8-96)
- Inventory Source and Treatment Record – Form #3 [MO 780-1233] (8-96)
- CT Calculations for Surface Water Plants
- Bacteriological Water Analysis sample card [MO 580-0751] 4-04)

Equipment

In addition to the equipment listed in the General Inspection Procedures chapter, the following is a listing of equipment that may be needed for specific types of sanitary surveys of public water systems.

- Testing equipment - Hach DREL 2400 Spectrophotometer, chlorine colorimeter, pressure gauge, iron test kit, hydrogen sulfide test kit, manganese test kit, fire flow testing gauges, turbidity test kit, etc.
- Sampling supplies – bacteriological water analysis card, microbiological sample bottles, rubber bands, cooler, propane torch or bleach spray bottle to disinfect faucets (plus shipping bottles and mailing labels if sending to the lab by courier or postal service)
- Global Positioning System (GPS) unit

Procedure

Regional office engineering staff will conduct sanitary surveys on the water systems assigned in the work plan, and when requested by the system or department management. Systems scheduled for sanitary surveys will mainly be primary community systems, primary non-community water systems with complex treatment facilities and large secondary systems with complex distribution systems. Use the latest Missouri Public Drinking Water Regulations, the Missouri Design Guide for Community Water Systems (August 29, 2003), the "Missouri Standards for Non-Community Public Water Supplies" (1982) and the "Missouri Guidance Manual for Surface Water Treatment Requirements" (1992) and good engineering practice to evaluate systems.

Before inspecting a water system it is necessary to review records on the system to become familiar with the system and its issues. While doing the review, write down questions and issues that you may need to address during the inspection. Prior to the inspection, review all of the system files to determine if the system is meeting all maximum contaminant level and monitoring requirements. Review inspection documents to determine ongoing issues that need to be addressed in the sanitary survey. Issues presented in reports of Compliance & Operation Inspections or Sanitary Surveys that have not been adequately addressed must be included in the sanitary survey report. Review the Public Water System Record form and if a groundwater system the Groundwater Supply Record form(s) on the system to become familiar with the system and its components. Review plans on the distribution system as needed to become familiar with the system. Review any engineering projects for the system to determine projects that should be under construction or completed. Review Reports of Low Pressures to see if the system is submitting the reports and to identify problem areas in the distribution system. If the system has an approval to operate an owner-supervised program of water main construction, review the submittals for the approval. The review of the treatment facilities includes the water plant wastewater treatment and sludge disposal facilities and activities.

Using the state Safe Drinking Water Information System (SDWIS), print the inventory information on the system so it can be reviewed for accuracy during

the inspection. Using SDWIS, print a compliance report for the past 12 months.

Prior to the inspection, contact the appropriate water system officials and set a date, time and meeting place to conduct the inspection, then explain the information that will be required during the inspection and explain if the inspection will take more than one day. Several days prior to the inspection, you may want to mail or fax to the water system the list of records and information that must be available for review during the inspection.

A few days before the inspection, check the testing equipment assigned to you to make certain that it contains everything necessary to perform the needed tests and that the equipment is properly calibrated. Tests that must be performed during an inspection vary with the degree of treatment provided at each system. At a minimum, the compliance and operational tests required by the Public Drinking Water Regulations should be done to assure that the system operators are performing the tests correctly and accurately. An exception to this is tests for chlorine dioxide and chlorites because the equipment to perform these tests is not portable. For those systems using chlorine dioxide, review the system testing procedures to see that tests are being performed correctly.

If the water system is not doing the tests, additional tests must be done to determine if different treatment processes are working properly. Therefore, review the Public Water System Record form to determine which tests may be necessary during the inspection and prepare the equipment necessary to do the tests. At a minimum, prepare to run turbidity tests on filter influent and effluent water of all plants with filters, both groundwater and surface water. For surface water plants, prepare to run turbidity tests on the raw water and the primary effluent. For systems with continuous turbidity monitors on the filters, review the system's calibration program to assure that it meets the manufacturer's recommended guidance.

For surface water plants, prepare to perform tests to collect the information necessary to do a disinfection contact time (CT) calculation for the plant. Use the CT Calculations for Surface Water Plants to review the calculation method and to determine the information necessary. For all water treatment systems with iron or manganese in the raw water, prepare to run tests for iron and manganese on the finished water and on filter influent and effluent water. For groundwater systems with no treatment or that just feed a chemical disinfectant, prepare to do tests for iron and/or manganese at each well for those systems that have experienced colored water problems. For surface water and lime softening plants, perform sufficient analyses or collect sufficient information to do a stability analysis of the finished water, using the Rothberg, Tamburini & Winsor Model. However, if a system does daily calcium carbonate stability tests, review the method, and if properly done accept the results of their test over the Rothberg, Tamburini & Winsor Model. Secondary systems that purchase water from a system required to disinfect must perform the distribution system disinfectant tests required by the regulations, so prepare to do chlorine residual tests at these systems. For systems providing fire flows, prepare to conduct a fire flow test on the distribution lines. At a minimum, pressure readings should be taken on the distribution system to ensure that 20 psig is available.

3.3 Drinking Water Inspections

During each inspection, fill out a Record of Public Water System Sanitary Survey Checklist provided by the Public Drinking Water Branch and use the form to guide you through the inspection. It is generally best to start the inspection at the system administrative offices to review water loss data, required ordinances, cross connection device test records, emergency plans, population, connections numbers, etc. Determine if changes need to be made to the SDWIS Inventory. The latest United States Census should be used to determine the current population. Previous US Census figures should be used to determine population trends and projections. For cities and public water districts, evaluate the system for 20- and 50-year projections. For subdivisions, current connections and built-out numbers should be evaluated.

If water distribution system records are maintained at the administrative offices, review the records while going over the other administrative information. For systems that provide fire protection, request a copy of the latest Insurance Services Office (ISO) review of the water system. Review individual hydrant and valve records. Determine fire flow needs based on the fire flow criteria in the ISO publication Fire Suppression Rating Schedule. Systems that do not provide fire protection, but have expressed an interest in providing it can be evaluated to determine what improvements would be needed.

During the inspection, find out the status of construction projects that have not been issued a Final Approval. Record the status of each project in the inspection notes. For completed projects, advise the system of the information that must be submitted to receive a Final Approval. Locate the site of the new system components from completed construction projects and document by Global Positioning System (GPS) unit or on a topographical map. If a system has an approval to operate an owner-supervised program, determine the status of the program during the survey and review system records to assure that the system is following the approved program.

For groundwater systems, inspect each well used as a source of water, including wells used as a standby or emergency water source. Then review the records on each well. Tests for drawdown, yield and static water level should be done monthly and recorded and amounts pumped should be recorded daily. Inspect each vent to assure that each well is adequately and safely vented.

Inspect the upper terminal to assure that well seals and caps are properly installed, are not damaged and are functioning properly to prevent contamination of the well. Inspect any penetrations into the well to assure they are properly sealed to prevent contamination of the well. Determine if the system has a wellhead protection program and review its implementation. For surface water systems using lakes, inspect each lake that supplies water to the system, including upper lakes that discharge to lower lakes and lakes used mainly as emergency sources. Inspect the water intakes in each lake and the associated pumping stations. Use the inspection checklist in the Missouri Dam and Reservoir Safety Council's publication *"Maintenance, Inspection and Operation of Dams in Missouri"* (1991) to do the inspections. For lakes with dams greater than 35 feet tall, ask to review the most recent dam safety inspection report. Determine if the system has a watershed management program and review its implementation. For surface water systems that use rivers or streams, inspect the raw water intakes and associated pumping stations. For systems with earthen raw water storage reservoirs, inspect the embankments forming the reservoirs as if they were dams using checklists in the Missouri

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Dam and Reservoir Safety Council's publication *"Maintenance, Inspection and Operation of Dams in Missouri* (1991). For secondary water systems, inspect every connection from each water supplier to the system.

Inspect each treatment facility from influent to effluent. Public Drinking Water Regulations require systems with treatment to perform sufficient analyses to maintain control of water quality and the treatment processes. During the inspection, review the operational test records to assure that sufficient analyses are being done. Collect sufficient information or perform tests to determine the effectiveness of each treatment process. Perform sufficient analyses to assure that required compliance and operational tests are being done correctly and accurately. Identify compliance, design, capacity, maintenance, condition, operation or housekeeping issues. For surface water systems, review the records on the continuous turbidity monitors to see if the system has compliance or filter operation issues. During the sanitary surveys, take global positioning readings on those water treatment plants, water sources, water storage facilities and pumping stations that have not had readings. Use the equipment assigned and the established protocol for taking the readings and entering them in the database.

During the sanitary survey, inspect each pumping station and finished water storage facility in the water system. Review pumping records for each pumping station to determine hours of operation and to assess capacity. For elevated storage facilities, do a ground-level inspection and use the spotting scope provided to look at screens, vents, overflows and access hatches as much as possible. Request to view the latest inspection reports done by tank inspection firms and if possible, obtain a copy. Use the department's technical bulletin Technical Guidance for Inspection of Water Storage Facilities [PUB2112] as a guide to inspecting elevated storage, and provide one to the appropriate water system official if they do not have a copy. Inspect the system's equipment for disinfecting water mains after repairs and safety equipment used during repairs. Question the distribution system operator concerning any flow or pressure problems in the distribution system.

The capacity of every component of the water system should be determined and evaluated versus the design guide. This is useful information that will be used to provide the water system with recommendations on upgrading for existing and future needs.

When evaluating the system flow demands, determine the average daily usage, maximum daily usage, and instantaneous peak flows. These flows should be evaluated for both current and future populations.

Reporting

Within 30 days of the inspection, a written report, cover letter and copy of the engineering calculations will be provided to the municipality, water district or owner. Send a copy to the Public Drinking Water Branch, and file a copy in the appropriate system file. In the comment section of the report, identify problems that the system has addressed and commendable actions or improvements that were done since the last inspection. If there are capitol improvements, operational, or personnel needs that will require additional costs to the system, the report should note it and provide information about the various funding sources available to the system. Fill out a data entry sheet and submit it to the Public Drinking Water Branch with the report. Make

appropriate changes to the Public Water System Record form and/or the Groundwater Supply Record form as noted during the inspection. GPS readings must be recorded on the Point Locational Data Collection Sheet with a copy sent to the Public Drinking Water Branch and the original placed in the system file.

Track and follow up on any deadlines, compliance dates or requests for response that you put in any report. In the cover letter of each report, request that the system officials respond in writing to the report within a specified time period explaining what the system intends to do to address the recommendations in the report. If a system has not responded within the time period specified, prepare a letter reminding the system officials of the request. If after the first reminder letter a response is not received, you may want to prepare a second reminder letter to be sent by certified mail.

3.3.9 Investigations of Unsafe Samples

Purpose
The purpose of the investigation of unsafe samples is to ensure that public drinking water systems are notified quickly when monthly samples test unsafe with either total coliform or *E. coli*, to remind systems of additional sampling and to assist the system in determining the cause of the contamination.

Forms
- Investigation of Unsafe Bacteriological Sample form (2.42)
- Bacteriological Water Analysis sample card [MO 580-0751] 4-04) (plus shipping boxes and mailing labels if sending to the lab by courier or postal service).
- Investigation of Unsafe Bacteriological Sample - letter template

Equipment
- Testing equipment: Hach DREL 2400 Spectrophotometer, chlorine colorimeter, turbidity test kit
- Sampling supplies: bacteriological water analysis card, microbiological sample bottles, rubber bands, cooler, propane torch or bleach spray bottle to disinfect faucets
- Global Positioning System (GPS) unit

See Section 3.1 of the General Inspection Procedures chapter for additional standard inspection equipment needed

Introduction
The Missouri Safe Drinking Water Regulations require all public water systems to submit one or more routine samples each month for bacteriological analysis. These tests are important to ensure that the water is safe to drink. Samples are tested for total coliform bacteria and fecal coliform or *Escherichia coliform (E. coli).* While coliforms can be opportunistic pathogens and several strains of *E. coli* can be serious human pathogens, typically these bacteria will not have a serious or lasting effect on healthy individuals. Because of their prevalence in the environment and their close association with human enteric pathogens, they are used as an indicator

organism for drinking water systems. In other words, the presence of these organisms indicates a problem with the water source, treatment or bacteriological integrity of the public water system (PWS). Total coliform bacteria comes from natural sources such as soil or decaying vegetation, and while systems must disinfect in order to remove the bacteria from the water, its presence is not considered an acute situation. However, because fecal coliform and *E. coli* are found in the feces of warm-blooded animals, their presence in drinking water denotes a much higher risk of other disease-causing organisms being present. Because of this, samples positive for fecal coliform and *E. coli* require more stringent measures both on the part of the department and the water system.

If a routine sample tests positive for coliform bacteria, the public water system must collect a set of repeat samples within twenty-four hours of notification of the positive result. Note that the department may extend this time period, as outlined in the regulations.

A system that collects more than one routine sample per month must collect no fewer than three repeat samples for each coliform-positive sample. A system that collects one routine sample per month must collect no fewer than four repeat samples for each total coliform-positive sample found.

At least one repeat sample will be from the sample tap where the original positive sample was collected, at least one repeat sample at a tap within five service connections upstream and at least one repeat sample at a tap within five service connections downstream of the original sampling site. The exact sampling locations can be adjusted as outlined in the regulations, but the total number of required repeat samples cannot be reduced.

Two or more positive total coliform samples during a given month are considered a maximum contaminant level violation. If any of the positive total coliform samples are also positive for fecal coliform or *E. coli*, this is considered an acute maximum contaminant level violation.

Sample Results - Initial Processing
Almost all sample results for systems located within the boundaries of the Northeast Regional Office, St. Louis Regional Office or the Kansas City Regional Office are sent to the Public Drinking Water Branch (PDWB) for initial processing and entry into the Safe Drinking Water Information System (SDWIS). The majority of sample results for systems located within the boundaries of the Southwest Regional Office or Southeast Regional Office, excluding those areas of the former Jefferson City Regional Office that still go to PDWB, are sent to their respective regional office for initial processing and entry. Private lab samples should be sent to the PDWB to be entered into SDWIS. All sample results received by the program will be reviewed to look for unsafe sample results as well as other issues, entered into SDWIS, then shipped to the appropriate region to be filed. Any positive samples found during the processing of sample results submitted to the PDWB are immediately faxed to the appropriate region for investigation.

Investigation of Unsafe Samples (Total Coliform)
Each unsafe sample result received by the regional office must be documented on an Investigation of Unsafe Bacteriological Sample form (2.42 form). This form is used as a tracking record for the unsafe sample and the corresponding repeat samples. It also serves as the investigation record that will be

copied to the regional facility file and to the program. Note that many regions use a modified form that is more specific to the types of systems or issues that are predominant in their region. In addition to the 2.42 form, each region may wish to employ additional methods of tracking (such as a logbook, database, etc.) particularly those regions that deal with a large number of unsafe samples. The unsafe sample is then assigned to technical staff for investigation. Staff located in a satellite office can be faxed a copy of the 2.42 form if they are assigned to the investigation.

The investigator may investigate either from the office or in the field. This decision is based first on staffing levels and time and this will vary from region to region. If it is determined that staffing levels allow for some field investigations, the region can make determinations on which systems to visit by looking at their monitoring history, maximum contaminant level violations, the presence of a certified operator, suspected cause of unsafe samples or other factors the region has set. Office investigations can be made either by telephone or by letter. Generally, telephone investigations are the preferred tool since pertinent information can be gathered during the conversation from the system regarding any possible reasons for contamination or minor sampling error. If the system cannot be reached by telephone and must be contacted by mail, a template letter is generally used.

In each case, staff must contact the owner or operator of the system and inform them of the positive sample and the requirement to take repeat samples. If the system collects fewer than five samples per month, staff must inform them of the requirement to collect five (5) routine samples in the following month.

During the investigation, staff should try to determine the cause of the positive sample and document this information on the tracking form. Once received, repeat sample results are also recorded on this form.

If all the repeats are safe (no violation), the investigator notifies the PWS of results and reminds them to collect five routine samples the next month. After the form is completed, a copy of the 2.42 form will be filed in the regional office drinking water file for the appropriate system and a copy sent to the program.

If one or more repeat samples are unsafe with total coliform bacteria (violation occurs), then the investigator must:

- Notify the system of the results and remind them to disinfect and flush the system and collect five routine samples the next month. Also advise them of the notice of noncompliance and public notice forms that will be sent to them by the PDWB.
- Record all conversations regarding possible sources of contamination and corrective actions taken, etc. on investigation form. The form is signed and dated when complete.
- Send a copy of the form to the PDWB.
- Place the original investigation form in the facility file.
- Regions may choose to use the information on the form in determining if the system has reached the point of needing inspection or enforcement action.

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If a routine total coliform positive sample is unsafe and one or more of the repeat samples are *E. coli*-positive, then the investigator must:

- Notify the PWS of results and issue Boil Water Order (this will include disinfection procedures, additional sampling needed and other notifications).
- Record all conversations regarding possible sources of contamination and corrective actions taken, etc. on investigation form. The form is signed and dated when complete.
- Send a copy of the form to PDWB.
- Place the original investigation form in the facility file.
- Regions may choose to use the information on the form in determining if the system has reached the point of needing inspection or enforcement action.

Investigation of Unsafe Samples (*E. coli* or fecal coliform**)**
Many laboratories will call the department when a sample is positive for *E. coli* or fecal coliform and if asked will usually fax the sample result ASAP to the region so that prompt procedure can begin.

The process for the *E. coli*-positive samples is basically the same as the above total coliform sample procedure except:

- Regional staff must investigate these sample results **in the field** the **next full working day** after receiving the result.
- During the investigation it is recommended that staff inform the PWS that any positive repeat sample would result in a boil water order.

If all the repeats are **"safe"** (no violation), then the investigator notifies the PWS of the results and reminds them to collect five routine samples the next month. After the form is completed a copy of the 2.42 form will be filed in the regional office drinking water file for the appropriate system, and a copy sent to the PDWB.

If one or more repeat sample is **"unsafe"** with *E. coli*, fecal coliform or total coliform bacteria (acute violation) then the investigator must:

- Notify the PWS of results and issue Boil Water Order. (This will include disinfection procedures, additional sampling needed and other notifications. See the I&E manual for exact procedures).
- Record all conversations regarding possible sources of contamination and corrective actions taken, etc. on investigation form. The form is signed and dated when complete.
- Send a copy of the form to PDWB.
- Place the original investigation form in the facility file.
- Regions may choose to use the information on the form in determining if the system has reached the point of needing inspection or enforcement action.

Additional Information

- If the system collects more than one monthly **routine** sample, and if two or more of these routines are unsafe, the system will receive an MCL violation for that month even if all of the '**repeats**' are safe.
- If the repeat samples are invalid, the investigator should call the system to inform them that replacement samples are required.

Reporting
As noted above, a copy of the investigation form is sent to the PDWB and the facility file.

3.3.10 Quick Reference List of Forms

- Application for a Construction Permit [MO 780-0701] (9-96)
- Application for Permit to Dispense Water
- Application for Transfer of Operating Permit
- Bacteriological Water Analysis sample card [MO 580-0751] (4-04)
- Compliance & Operational Inspection form [MO 780-1617](2-01)
- CT Calculations for Surface Water Plants
- Emergency Operation Plan [various model plans and forms online]
- Groundwater Supply Record
- GWUDISW Determination Checklist for Public Water Systems (Groundwater Under Direct Influence of Surface Water)
- Inventory Address Data – Form #2 [MO 780-1232] (8-96)
- Inventory Public Water System Record – Form #1 [MO 780-1231](8-96)
- Inventory Source and Treatment Record – Form #3 [MO 780-1233] (8-96)
- Investigation of Unsafe Bacteriological Sample form (2.42)
- Investigation of Unsafe Bacteriological Sample - letter template
- Microbiological Sample Siting Plan for Public Drinking Water Systems
- Operational Survey form [MO 780-1198] (12-89)
- Owners And Operators Handbook for Non-Community Public Water Supplies (date revised specific to Regional Office – original from JCRO 11/5/02)
- Owners And Operators Handbook for Small Community Public Water Supplies date revised specific to Regional Office – original from JCRO, 11/5/02)
- Point Locational Data Collection Sheet
- Procedures for Flushing, Disinfecting, and Testing Seasonal Public Water Supplies
- PTS Tracking Slip PDWB – FY2006 (production tracking system)(date revised specific to each regional office)
- Public Water System Record
- Record of Construction Inspection
- Record of Public Water System Sanitary Survey Checklist
- Report of Construction Inspection
- Report of Field Survey
- Survey of Pressure Grout Sealing of Well Casing
- Technical Assistance Visit form [MO 780-1650] (1-98)
- Technical, Managerial and Financial Capacity Assessment Checklist
- Water Treatment System and Water Distribution System classification worksheets